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Building Wealth Through Internal Financing of Energy Savings Performance Contracts

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The Energy Savings Performance Contract (ESPC) program is an important contracting avenue for federal facilities mandated to reduce overall energy consumption. Currently the program allows federal agencies to obtain private financing to pay for the infrastructure improvements that lead to reduced energy consumption. Controversy over the true cost of private financing continues to jeopardize the future of the program. The DoD could benefit from using its own resources to establish a revolving fund that replaces the private financing thus creating energy "wealth".

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BUILDING WEALTH THROUGH INTERNAL FINANCING OF ENERGY SAVINGS PERFORMANCE CONTRACTS

Anthony M. Pedroni, Captain, United States Air Force

Submitted in partial fulfillment of the requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

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December 2005

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BUILDING WEALTH THROUGH INTERNAL FINANCING OF ENERGY SAVINGS PERFORMANCE CONTRACTS

ABSTRACT

The Energy Savings Performance Contract (ESPC) program is an important contracting avenue for federal facilities mandated to reduce overall energy consumption. Currently the program allows federal agencies to obtain private financing to pay for the infrastructure improvements that lead to reduced energy consumption. Controversy over the true cost of private financing continues to jeopardize the future of the program. The DoD could benefit from using its own resources to establish a revolving fund that replaces the private financing thus creating a self-sustaining program that increases energy "wealth".

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I. INTRODUCTION

A. INTENDED PURPOSE

The purpose of this study is to determine the viability of cost savings resulting from the Department of Defense (DoD) internally financing Energy Savings Performance Contracts (ESPC). Currently all federal agencies use external, private financing to pay the up-front costs of the program. This study will determine what benefit, if any, the DoD will realize by creating an internal financing mechanism.

The issue of energy efficiency is becoming more important each year. According to the Congressional Budget Office (CBO), "The federal government is the single largest energy consumer in the nation, spending about $3.7 billion in fiscal year 2002 on energy for its approximately 500,000 facilities in the United States."[1] The government's large, aging facility footprint coupled with rising energy costs are combining in an undesirable synergy, resulting in escalating, non-discretionary energy bills.

The executive branch has taken proactive measures to improve the overall energy efficiency of the federal government. Most notable is Executive Order 13123. Signed in 1999, the order mandates that all federal agencies reduce total energy consumption by 35%, based on a 1985 baseline, by the year 2010.[2] At long last, energy management has a metric and a deadline. A more subtle section of EO 13123 gives encouragement to use all authorized financing programs. Therefore, agencies not only have a goal with a deadline, but also a suggested path to accomplish the requirements.

B. BACKGROUND

Energy Savings Performance Contracts fulfill an important role in the infrastructure maintenance at DoD facilities. The premise of the program is to give

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[1] Congressional Budget Office, Cost Estimate for H.R. 1533, May 2005, available from http://www.cbo.gov/showdoc.cfm?index=6396&sequence=0, accessed 1 Oct 2005

[2] Executive Order 13123, Greening The Government Through Energy Efficient Management, Federal Register Vol. 64, No. 109, 8 June 1999

engineers the flexibility to improve overall facility energy efficiency by financing infrastructure improvement projects, thereby avoiding the normal appropriation channels.

1. The History of the ESPC Program

Congress gave federal agencies the authority to enter into ESPCs in 1992. The contract authorization was officially codified in National Energy Conservation Policy Act (42 USC 8287).[3] The law allows agencies to finance energy savings projects for up to a period of 25 years. Congress stipulated that "Aggregate annual payments by an agency… under an energy savings performance contract, may not exceed the amount that the agency would have paid for utilities without an energy savings performance contract (as estimated through the procedures developed pursuant to this section) during contract years." [4] Therefore, ESPCs allow agencies to invest in energy saving infrastructure improvements so long as those improvements pay for themselves within a 25-year financing period.

42 USC 8287 established in the minds of federal agencies, that ESPCs are a zero cost program for the government, creating a new source of money available for Operations and Maintenance (O&M) investment. The size of each investment is only limited by the total value of the saved energy, thus no net annual loss for the government. The no cost label enabled installations to use ESPCs to obtain the required equipment upgrades needed to move closer to the energy reductions mandated in EO 13123. The Department of Defense has led all federal agencies, awarding approximately 153 ESPCs, an investment worth about $1.8 billion, impacting nearly 100 military installations.[5] The popularity of these contracts within DoD has led to a substantial long-term commitment, under the auspice of "no cost" to the government.

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[3] 42 United States Code 8287, Energy Savings Performance Contracts, [database online] available from http://www4.law.cornell.edu/uscode/html/uscode42/usc_sec_42_00008287----000-.html, accessed on 1 October 2005

[4] Ibid

[5] Congressional Budget Office, Cost Estimate for H.R. 1533, May 2005, available from http://www.cbo.gov/showdoc.cfm?index=6396&sequence=0, accessed 1 Oct 2005

2. What ESPCs Do for the DoD

Energy Savings Performance Contracts play an important role in maintaining DoD's critical energy infrastructure. Energy intensive equipment supports vital mission essential activities. ESPCs directly address this genre of equipment. In particular, more efficient equipment is generally more reliable. Increased reliability results in an enhanced ability to deliver the required mission support. Overall, with an ESPC, the equipment delivers the support with more certainty than equipment not managed to maximum efficiency.

Energy efficiency improvements support the DoD mission in several ways. For example, lighting accounts for approximately 40-50% of total electrical use inside commercial spaces.[6] Furthermore, without proper lighting, indoor tasks become more difficult. One solution is mission oriented, adding more lighting to the workspace, regardless of energy use. On the opposite end of the spectrum is saving energy at the cost of mission capability, sacrificing necessary lighting by mandating, across-the-board, cuts in overall lighting levels. An ESPC seeks to determine the required quantity and type of light for the task and then deliver it with the most effective, and efficient, system. The result is the creation of a program where the opposing forces of mission accomplishment and energy efficiency are in balance. Lighting is not the only example of the juxtaposed positions of efficiency and capability.

Heating, Ventilating, and Air Conditioning (HVAC) equipment is an example of mechanical equipment infrastructure where ESPCs do the most to cost effectively meet mission support requirements. The DoD maintains bases in many extreme climates. Heating is critical to base operations in places like Fairbanks, Alaska. On the other extreme, air conditioning allows missions to succeed in hot, humid climates such as Guam. Air conditioning uses an extremely large sum of electricity to run a complex series of compressors, fans, and pumps. Both systems are extremely expensive. Finally, this equipment can last much longer than the predicted life cycle. Planning for the costly, unpredictable and inevitable replacement is very difficult. ESPCs allow the DoD to

[6] Energy Information Administration, Lighting in Commercial Buildings-1986, [online database], available from http://www.eia.doe.gov/emeu/cbecs/cbecs2f.html, accessed on 18 Oct 2005

replace old, inefficient HVAC units, extend the useful life of properly working units, and reduce the frequency of failures, all while consuming less energy. Once again, a properly implemented ESPC finds the balance between efficiency and mission support through comprehensive planning.

3. ESPC Benefits for the DoD

The ESPC program provides a significant benefit to the DoD by breaking the bond between appropriated dollars and infrastructure investment. Under normal circumstances, a base or installation has to dedicate a significant percentage of its annual Operations and Maintenance (O&M) budget to upgrading its environmental controls and lighting. Unfortunately, in budget-constrained circumstances, bases are often only able to fully fund the most critical O&M projects, deferring the repair and replacement of old but operational equipment to future years. As this cycle is repeated each year, only the equipment that is beyond repair is actually replaced. Thus, after sequential years of under investment, the DoD is left with an infrastructure reliant upon equipment that has exceeded its useful life span. ESPCs allow bases to seek funding, outside of the appropriations process, thus breaking the cycle of under funded appropriations.

The aging infrastructure phenomenon is seen through mostly anecdotal evidence. The Government Accountability Office (GAO), congress, and the media all reference the difficulty, real or apparent, installations have in obtaining appropriated funds for infrastructure upgrades. The difficulty of managing an energy program, representative of most DoD installations, is found in an article written by the Energy Manager at Kirtland Air Force Base, NM. The manager bemoans the agonizing appropriations process. Appropriations rarely provide enough funds for a comprehensive plan that can be implemented over a short period of time to capture all the available benefits. While cautionary on the ESPC program costs, the manager does cite the ability to work outside the appropriations process as the single biggest benefit to the installation.[7] Therefore, if

7 Weber and Huckeby, Defense AR Journal. Fort Belvoir: Feb/Mar 2005. Vol. 12, Iss. 1; p. 78

installations can find a substantial value in managing the infrastructure equipment via the ESPC, then both the DoD and its installations are the recipients of the aggregate benefits from infrastructure improvement.

The ESPC can also benefit the DoD financially. As stated earlier, installations can undertake an investment equal to the present value of the forgone energy consumption. The Federal Energy Management Program depicts the before, during and after effects of an ESPC on an agency's energy budget.

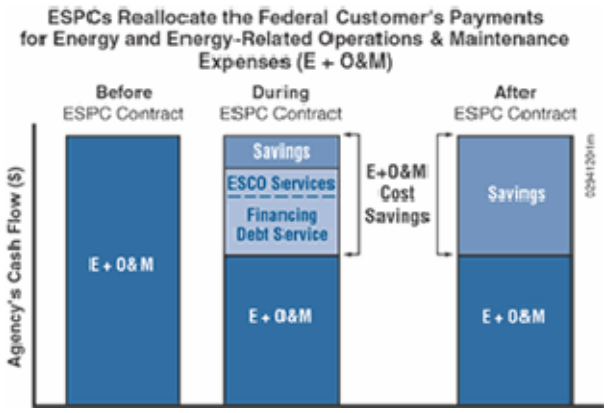

Figure 1. Annual Expenses Before, During, and After ESPC

From Federal Energy Management Program, accessed from www.eere.femp.gov, 1 Oct 2005

In this example, the agency is first paying for the status quo Energy plus Operations and Maintenance. The contract provides an investment that results in a total annual cost savings. After the investment obligation is paid off, the agency realizes the annual avoided costs, theoretically making money available for core mission activities.

From a more abstract perspective, the ESPC benefits the DoD by allowing the department to unlock the value currently residing in unnecessary annual energy expenses. There is an added benefit of reinvesting the unlocked value back into the system. Currently, without an energy contract, investments made through appropriations are extremely difficult to tie to a specific savings result. The ESPC promotes both energy

savings and energy infrastructure investment at the same time and at a level that is inherently balanced.

4. How Much Does the ESPC Program Cost the DoD

There is no clear consensus on the true cost of an ESPC. Proponents say that the financial payments are made out of actual, avoided energy bills, therefore there is no annual cost to the government. Critics of the program, particularly the GAO, point to the, lack of competition, program complexity, and imbedded interest rates charged by the financial institutions as a sign of the additional cost of private financing when compared to the government's cost to finance via treasury bills.[8] This is a typical, politically charged comparison because both sides are correct.

The proponents of the ESPC correctly defend that ESPCs do not cost the government. In an annual budgetary sense, this is true. Before the contract, the agency must foot the energy bill regardless of cost. After the contract, the installation pays the reduced energy bill while also paying the bank to service the debt on the financed equipment. The net budgetary result for the installation is zero or slightly positive. The result is new equipment for the government without any change to the total annual outlays.

Critics point out that the only dependent variable when defining the terms of an ESPC contract is time. The principle borrowed is based on how much the equipment costs. The amount of annual savings is determined by the sum total of the measures implemented. The finance institution sets the interest rate. Therefore, the base can only manipulate the amount of principle borrowed and the value of annual energy savings. As the borrower, the base has little control over the interest rate. All three variables result in the length of the contract term. The GAO argues that the rates set by the financial institutions are greater than what the government could borrow via Treasury Bills therefore resulting in longer ESPC contract terms. The result of the higher rate and

[8] General Accountability Office, Energy Savings: Performance Contracts Offer Benefits, but Vigilance Is Needed to Protect Government Interests, p. 35, [database online], GAO-05-340, June 2005, available from www.gao.gov/cgi-bin/getrpt?GAO-05-340, accessed on 1 Oct 05

longer term is a higher present value of the payments made by the government than if the work was financed with Treasury Bills.[9]

C. RESEARCH QUESTIONS

This research revolves around the financing aspect of the ESPC program. The primary research questions will determine the feasibility of an alternative financing program.

1. Primary Research Question

Does internal financing of the ESPC program create energy wealth for the DoD?

Wealth, in this case, is not of the traditional definition. The DoD does not accumulate money. For the purposes of this project, wealth is the quantity of money unlocked from current energy bill obligations and reinvested into the energy infrastructure of a DoD installation.

2. Secondary Questions

In order to answer the primary research question, secondary questions must be considered.

What is the financial magnitude of using internally financed projects instead of the current private lending institutions?

The amount of money available to be unlocked is crucial to the feasibility of the proposed financing mechanism.

Is there an mechanism, internal to DoD, available to facilitate investment cash flow for ESPC projects?

[9] General Accountability Office, Capital Financing: Partnerships and Energy Savings Performance Contracts Raise Budgeting and Monitoring Concerns, p. 26,GAO-05-55, December 2004, [database online] available from www.gao.gov/cgi-bin/getrpt?GAO-05-55, accessed on 1 October 05

The implementation of an internal mechanism must add value to the DoD energy infrastructure. The net effect of the investment and subsequent cash flow must follow a logical path that builds wealth.

D. THESIS SCOPE

This thesis will only look at the financing aspect of the ESPC program. The option of paying for energy improvements with full, up-front appropriations will not be considered as an alternative. Furthermore, the current contracting process and engineering principles will not be considered for improvement. The ESPC program has many facets that could possibly be improved upon. For example, there is no widely accepted principle of measuring and verifying the effectiveness of Energy Control Measurers (ECM). Some agencies require an annual audit of the ECMs, while others regard the calculations as an unnecessary expense without any scientific merit. Another criticism of the program is its reactive nature. Critics point to the hundreds of thousand of square feet added to the DoD inventory each year as an area where ESPC principles could reduce the need for almost immediate energy retrofit. No easy method is available to incorporate Energy Savings into the design process. Therefore, installations do not have an incentive to submit energy efficient Military Construction designs. Despite these difficulties, the financing of the ESPC program is most closely related to the Financial Management curriculum, the centerpiece of this paper. Aspects of the program that have an impact on financial management will be considered but will be considered only for financial management implications not for engineering or contracting effects.

E. BENEFITS OF THIS STUDY

The government practice of financing energy projects has recently been living on borrowed time and is in need of a revolutionary change to permanently win needed Congressional support. As stated earlier, the ESPC program was actually allowed to expire at the end of FY2003 before being renewed for a single year. The lack of commitment from Congress is understandable due to the real costs of the program. The CBO estimates that the equivalent annual direct spending cost of the ESPC program

(construction plus financing costs greater than treasury rates) will be $300M in FY2007 and the annual sum will grow about 5% each subsequent year.[10] Therefore, it is evident that the ESPC program is not a free lunch for the federal government.

The DoD should not have to rely only upon the private sector for the flexibility offered through energy project financing. A change to the financing aspect of the ESPC program should unlock enough value in the current energy obligations to pay for any initial investment and for future projects long into the future. Therefore, this study will help determine if there is a benefit to utilizing internal financing or if the current private financing mechanism is more effective.

F. RESEARCH METHODOLOGIES

The first phase of research determined what terms are currently being used to finance energy projects. The General Accounting Office recently completed a comprehensive study into the relative characteristics of ESPCs. Important factors such as principle financed, years, interest rates, and annual payments were used to determine the typical project size and scope. These data were used to determine the typical ESPC contract.

The typical contract was then used as the basis for creating a financing profile for the internal financing option. The internal option has to be a fair comparison. Therefore, by using the typical contract, the comparisons will be able to quantify the potential for wealth to be built using the internal mechanism.

G. THESIS ORGANIZATION

This thesis is organized to compare and contrast the current and proposed ESPC financing mechanisms. Chapter I introduces the ESPC program. In this section, the history of the program, its benefits, and the program's costs are discussed.

[10] Congressional Budget Office, Cost Estimate for H.R. 1533, May 2005, available from http://www.cbo.gov/showdoc.cfm?index=6396&sequence=0, accessed 1 October 2005

In Chapter II, a literature review is conducted. This chapter looks at the published documents surrounding the ESPC program. It focuses on the reports and articles that are directly related to the financing portion of the program. In addition, the review outlines, in basic terms, how wealth is created in financial institutions.

Chapter III outlines the existing ESPC financing program. The qualitative advantages and disadvantages of private financing are discussed. The quantitative costs of using private financing are also be outlined. In this section, a historically based, average project is be determined and used in subsequent sections to compare and contrast the advantages of alternatives.

Chapter IV focuses on the proposed alternative of DoD internally financing ESPC projects. The average project, as defined in Chapter III, is used to assess how much long-term wealth can be built using internal financing. Various combinations of interest rates and terms are used to measure the sensitivity of the program.

Chapter V takes the findings from Chapter III and IV and recommends one alternative over another. The recommendation is based only upon the data as assumed and derived from the limited sources of available information.

II. LITERATURE REVIEW

A. PRINCIPLES OF ENERGY EFFICIENCY

The field of energy efficiency is studied from many different angles. The financial ramifications for public and private entities are staggering. The American Council For An Energy Efficient Economy (ACEEE) published its *Online Guide To Energy Efficient Commercial Equipment*. In the guide, ACEEE estimates that within the United States, building owners spend, on average, $\$1.21/ft^2$ for energy services.[11] Energy services, in this case, include heating, cooling, and lighting.

B. FEDERAL ENERGY MANAGEMENT

1. Executive Branch Energy Management

The Federal Energy Management Program (FEMP) is the agency tasked with defining the goals for the federal government's energy program. The FEMP website is the primary source for DoD facilities seeking energy management guidance. The office puts the onus on facility managers to, "Make choices that are cost-effective, energy-smart, environmentally sound, and reliable."[12] Therefore, the federal government defines energy efficiency as balancing cost savings without adversely affecting the environment or the mission. FEMP states the government's vision based on this definition, "By promoting energy efficiency and the use of renewable energy resources at federal sites, the Federal Energy Management Program helps agencies save energy, taxpayer dollars, and demonstrate leadership with responsible, cleaner energy choices."[13]

The mandate behind the federal government's energy programs is Executive Order 13123, *Greening The Government Through Efficient Energy Management*. The document set numerous goals for the federal government. It set the far-reaching goal to

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[11] American Council For An Energy Efficient Economy, Online Guide to Energy-Efficient Commercial Equipment, [online magazine], available from http://www.aceee.org/ogeece/ch1_index.htm, accessed 1 Oct 2005

[12] Federal Energy Management Program, [online magazine] http://www.eere.energy.gov/femp/technologies/technologies.cfm, accessed 15 Sep 2005

[13] Federal Energy Management Program, http://www.eere.energy.gov/femp/, accessed 15 Sep 2005

reduce the amount of energy consumed across all federal agencies. Section 202 states, "Through life-cycle cost-effective measures, each agency shall reduce energy consumption per gross square foot of its facilities, excluding facilities covered in section 203 of this order, by 30 percent by 2005 and 35 percent by 2010 relative to 1985."[14] EO13123 also aims to reduce greenhouse gas emissions, enhance water conservation, reduce total petroleum consumption, and to initiate the procurement of renewable energy sources.[15] The order also gives guidelines on how to achieve the mandates.

EO13123 singles out two preferred sources of capital for agencies to invest into energy reduction. First, the agencies are directed to submit, within the annual budget, requests for money to be directed to achieving the energy reduction mandates. It also stipulates that agencies are to utilize all available alternative financing options, specifically Energy Savings Performance Contracts.[16]

2. Executive Branch ESPC Financing Efforts

Recently, FEMP established a working group to look specifically at ESPC financing. The working group published the report, *Reducing Financing Costs for Federal ESPCs*, on December 7, 2004. The report looks at the critiques of the ESPC program, assesses the weaknesses, and recommends corrective measures that will enhance the program. The working group recommends a set of reforms.

> These reforms directly address concerns related to cost-effectiveness of ESPCs that were raised by several government audits and assessments of federal ESPCs awarded under DOE's and other agencies' programs. Incorporating these practices will mitigate many of the problems pointed out in those documents, but will also improve and strengthen federal ESPC programs to the benefit of all participants. With lower financing costs, ESPCs can have shorter terms, or agencies can gain more improvements for the same money. Larger projects will add to the sales of private-sector ESCOs. The new requirements will also allow greater participation by more private-sector financiers. All participants will

[14] Executive Order 13123, Greening The Government Through Energy Efficient Management, Federal Register Vol. 64, No. 109, 8 June 1999, p. 30851

[15] Ibid

[16] Ibid

> benefit from improvements that bolster confidence in the value of federal ESPCs and strengthen the case for permanent extension of the federal ESPC authority.[17]

The working group identifies the hidden value currently tied up in the financing aspect of ESPC projects. They were able to determine that the result of more advantageous financing terms will result in a wider scope of projects for the same amount of investment.

The Finance Cost Reduction Working Group focused its attention on the lack of competition amongst prospective financiers. The most significant reform proposed by the working group is to introduce an element of competition between financiers. The working group recommends that the ESCO solicit at least three different financing offers.[18] The working group expects the competitive aspect to result in better terms for the government.

3. GAO ESPC Reports

The GAO is the government agency charged with maintaining accountability for the federal government and its agencies. It published a report, *Performance Contracts Offer Benefits, But Vigilance Is Needed To Protect Government Interests*, on June 22, 2005. Additionally, the GAO also looked at the ESPC program in December 2004 with a report titled, *Partnership and Energy Savings Performance Contracts Raise BudgetingAnd Monitoring Concerns*. Together, these two reports raise the harshest criticism of the way the ESPC program is represented in the budget and how contracts are executed on behalf of the government.

The June 2005 report is the most comprehensive publication on how the ESPC program has been used by the various government agencies. The GAO reports:

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[17] Finance Cost Reduction Working Group, Reducing Financing Costs for Federal ESPCs, [online database] , p. vi, available from www.ornl.gov/sci/femp/pdfs/fcrwg_rpt_espcsc_041207.pdf accessed December 7, 2004

[18] Ibid, p. 3

(1) The extent to which federal agencies use ESPCs.

During fiscal years 1999 through 2003, numerous agencies undertook ESPCs to finance energy-efficiency improvements, committing the federal government to annual payments totaling about $2.5 billion over the terms of these contracts. The use of ESPCs has been geographically widespread, with many types of equipment installed, and the extent of use has varied across the agencies.[19]

(2) What energy savings, financial savings, and other benefits agencies expect to achieve.

Agencies expect to achieve benefits that include energy savings worth at least $2.5 billion over the life of the contracts, as well as other benefits that cannot be easily quantified, such as improved reliability of the newer equipment over the aging equipment it replaced, environmental improvements, and additional energy and financial savings once the contracts have been paid for."[20]

(3) The extent to which actual financial savings from ESPCs cover costs;.

Agencies structure ESPCs so that financial savings cover costs and they reported that many do. However, GAO could not verify that conclusion using the data on ESPCs, and GAO work and agency audits disclosed ESPCs in which unfavorable contract terms, missing documentation, and other problems caused GAO to question how consistently savings cover costs. Furthermore, differing interpretations of the law establishing ESPCs about what components of costs must be paid for from the savings generated by the project or may be paid for using other funding sources have contributed to uncertainties about whether savings are appropriately covering costs.[21]

(4) What areas, if any, require steps to protect the government's financial interests in using ESPCs.[22]

According to agency officials, they often lacked the technical and contracting expertise and information (such as interest rates and markups) to negotiate ESPCs and to monitor contract performance in the long term. The officials also think

[19] General Accountability Office, Energy Savings: Performance Contracts Offer Benefits, but Vigilance Is Needed to Protect Government Interests, p. 35, [database online], GAO-05-340, June 2005, available from www.gao.gov/cgi-bin/getrpt?GAO-05-340, accessed on 1 October 2005

[20] Ibid, p. 1

[21] Ibid

[22] Ibid, p. 53

there may be insufficient competition among finance and energy services companies and that this could lead to higher costs for ESPCs." [23]

Using these objectives, the GAO formulated a very broad recommendation for improving the program. The GAO states that Congress should clarify what contract costs must be covered by the energy savings. The GAO also recommends that agencies implement elements of competition to ensure savings cover the costs. Finally, the GAO wants the DOE to take a more active role in facilitating the ESPC program for the entire federal government.[24] The report provides numerous case studies to support the recommendations.

The 2004 report is the first government sponsored research into the true cost of the ESPC program. The report looks at the impact the ESPC program commitments have on the annual budget process and how to properly capture the cost of the contracts. The objectives of this report are outlined in three parts.

1. What specific attributes of energy savings performance contracts (ESPC) and public/private partnerships (partnerships) contribute to budget scoring decisions.

2. The costs of financing through ESPCs and partnerships compared to the costs of financing via timely, full, and up-front appropriations.

3. How ESPCs and partnerships are implemented and monitored.[25]

The GAO wants to make sure that Congress is able to compare the ESPC program's true cost against up-front appropriations in order to make necessary budget decisions.

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[23] General Accountability Office, Energy Savings: Performance Contracts Offer Benefits, but Vigilance Is Needed to Protect Government Interests, p. 1, [database online], GAO-05-340, June 2005, available from www.gao.gov/cgi-bin/getrpt?GAO-05-340, accessed on 1 October 2005

[24] Ibid, p. 54

[25] General Accountability Office, Capital Financing: Partnerships and Energy Savings Performance Contracts Raise Budgeting and Monitoring Concerns, p. 50,GAO-05-55, December 2004, [database online] available from www.gao.gov/cgi-bin/getrpt?GAO-05-55, accessed on 1 October 2005

C. PUBLIC POLICY VIEWS OF THE ESPC PROGRAM

Public policy organizations also play a role in the open discussion defining the ESPC program. These alliances organize the views of energy efficiency experts, local and state governments, ESCOs, and private citizens. They all share an interest in improving energy efficiency.

1. The Alliance to Save Energy

The Alliance to Save Energy (ASE) is an organization formed to support all forms of energy efficiency. Specifically, the group has published its position that the ESPC program is a strong partnership between the government, contractors, and the financial industry. According to ASE, "Approximately $1 billion in taxpayer dollars is still wasted each year in buildings alone."[26] Therefore, according to the ASE, the government has a long path ahead toward energy responsibility. The ASE takes this position to Congress in an effort to influence public policy.

The ASE wants the federal government to resolve the ambiguity surrounding the true costs of the ESPC program. In a letter to the House Budget Committee (March 2005) ASE, and other interested parties, asked Congress to determine the proper ESPC costs, "The budget score assigned by CBO conveys the false impression that ESPCs require billions of dollars of new federal spending. The CBO methodology does not account for contractual obligations on the private sector to ensure that an ESPC project reduces government costs."[27] To further cloud the issue, ASE cites OMB's position that the ESPC program is budget neutral and that it saves the government money in the long run.[28] Therefore, there is no clear stance by the federal government on the true cost of the ESPC program.

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[26] Alliance to Save Energy, Fact Sheet, [online magazine] available from http://www.ase.org/uploaded_files /policy/FEMP%20Fact% 20Sheet.pdf, accessed 15 Oct 05

[27] Ibid

[28] Ibid

The ASE and its partners avoid the assertion that the ESPC is a no cost program. The group only asserts that the government benefits from saved energy and money.[29] There is no quantitative analysis of the amount of money saved for every dollar invested. The emphasis of the argument is the post contract scenario, "The **government keeps all the savings** after the investment is paid off, allowing taxpayer dollars to be used for other necessities**.**"[30] This argument is not supported with any quantitative analysis regarding the present value of the future savings, only the assertion that the savings exist.

2. The Ernest Orlando Lawrence Berkeley National Laboratory ESCO Service Study

The Lawrence Berkeley National Laboratory conducted a study, *Public and Institutional Markets for ESCO Services: Comparing Programs, Practices and Performance,* into the costs and benefits of the government's partnership with the private ESCOs. The study emphasizes the actual contractual performance of the ESCOs and the promised performance goals. The scope of the study includes the federal government as well as municipalities, universities, schools, and hospitals (MUSH).[31] They looked at 1,634 projects, of which 129 were federally sponsored ESPC projects. Together, these data provide a unique insight into the commercially financed energy performance contract marketplace.

The key findings in this paper tell the story of the energy savings marketplace. The study found that the 1,634 projects accounted for up to $19B in energy infrastructure investment.[32] Once again, the lack of central control over these contracts prevents a definitive accounting of all contracts. The study determined that the federal ESPC program is, "Cost-effective and represents a value, not a cost, to the federal

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[29] Alliance to Save Energy, Fact Sheet, [online magazine] available from http://www.ase.org/uploaded_files /policy/FEMP%20Fact% 20Sheet.pdf, accessed 15 Oct 05

[30] Ibid

[31] Lawrence Berkeley National Laboratory, Public and Institutional Markets for ESCO Services: Comparing Programs, Practices and Performance, [online database], p. ix, available from http://eetd.lbl.gov/EA/EMP/reports/55002.pdf, accessed 1 Oct 05

[32] Ibid, p. xvii

government."[33] The findings are both quantitative and qualitative but the final determination of value takes an unorthodox view of determining value.

From the perspective of the Laboratory, the hidden cost of investing in energy infrastructure is not financing the construction costs but rather it is the opportunity cost in delays in the appropriations process. In the words of the authors, "Project delay significantly erodes net benefits. In a congressional budget environment with limited availability of capital to fund energy-efficiency projects, financed Super ESPC projects represent an attractive investment approach, in part because contractual guarantees ensure that benefits will persist over the project's economic lifetime."[34] The Laboratory has found that more money is wasted in the form of higher energy bills during the long appropriations process than is spent financing the expedient ESPC process.

The Laboratory repackages the opinions of the GAO regarding the reluctance of energy managers to seek appropriations.

> Our results suggest that timely appropriated projects may provide equal or greater net benefits than financed ESPCs. However, in reality most projects do not receive timely appropriations and appropriated projects, when funded, often take longer to develop and implement. Even at the most forgiving discount rate (5%), delays of more than one year in obtaining congressional appropriations result in reduced net benefits relative to ESPC-financed projects. The longer an agency waits, the more drastic this effect. [35]

The delays of the appropriation process decay the benefits of implementing the energy projects. The study summarizes the reality of appropriations and alternative financing. "Financing energy-efficiency investments can allow customers to capture years of energy savings that could be lost waiting for alternative means of financing to materialize."[36]

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[33] Lawrence Berkeley National Laboratory, Public and Institutional Markets for ESCO Services: Comparing Programs, Practices and Performance, [online database], p. xviii, available from http://eetd.lbl.gov/EA/EMP/reports/55002.pdf, accessed 1 Oct 05

[34] Ibid

[35] Ibid

[36] Ibid, p. 56

D. LENDING AND FINANCING

1. Ritter and Silber

In *Principles of Money, Banking, and Financial Markets* Lawrence S. Ritter and William L. Silber lay the foundation of the banking system. They summarize the principles behind lending and borrowing.

> Financial institutions have sprung up-such as commercial banks, savings banks, savings and loan associations, credit unions, insurance companies, mutual funds, and pension funds-that act as intermediaries in transferring funds from ultimate lenders to ultimate borrowers. Such financial intermediaries themselves borrow from savers-lenders and then turn around and lend the funds to borrowers-investors. They mobilize the savings of many small savers and package them for sale to the highest bidders. In the process, again both ultimate saver-lenders and ultimate borrowers-investors gain.[37]

Under the proper circumstances, all parties benefit from these transactions. According to Ritter and Silber, the saver benefits from the interest paid by the bank, assuming the alternative for the saver is holding cash. The borrower gains by investing in a project that has a higher rate of return than the interest charged by the bank. Finally, the bank gains by charging the borrower a higher rate than it is giving to the saver.[38] This process results in the bank creating money. It increases the amount of money in deposits by lending money to borrowers who pay interest back to the bank.

The banking industry does have limitations. The authors state, "A commercial bank can lend up to the amount of its excess reserves, and no more."[39] This leads to the authors' argument that there is a constant tug of war between the relative safety of liquidity (money in reserves) and the need to make a profit by lending money to borrowers.[40] Banks are torn between paying out interest to attract savers while at the

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[37] Ritter and Silber, *Principles of Money Banking and Financial Markets*, Basic Books Inc, NY, 1986, p. 11

[38] Ibid p. 10

[39] Ibid, p. 37

[40] Ibid,p. 127

same time finding quality borrowers that will generate the return needed to be profitable. Therefore, the profitability risk is mitigated by the spread between these two interest rates.

2. Prather's View in *Money and Banking*

In *Money and Banking*, Charles Prather examines the nature of the banking industry. Topics in this book include management of bank funds, risk, and commercial bank earnings.

According to Prather, banks walk a fine line between profitability and insolvency. He states, "Over a period of years a sound bank must earn enough interest to pay all its expenses, to cover losses, and to provide a reasonable return on its capital accounts."[41] If this one principle is violated, the bank looses its capital accounts. Therefore, states Dr. Prather, the bank no longer has enough assets to meet the demand of deposit accounts.

The function of bank management is to address the risks of banking sufficiently to ensure that the bank remains profitable. Dr. Prather identifies many banking risks: attracting new customers (borrowers and savers), optimizing liquidity, risk of a bank run, risk from insolvency, and risk from the uncontrollable (war). Above all, Prather states that, "While a bank's liquidity is important, the danger of nonliquidity is minor compared to the danger of insolvency."[42] Insolvency occurs when the bank does not have enough assets to meet its obligations. According to Prather it is as simple as, "a few bad loans, one unsound investment, or one dishonest employee."[43] Therefore, in banking, management must decide to loan funds to quality projects and use the interest rate it charges to ensure the long-term profitability of the institution.

ESCOs have chosen the banking industry as the source of capital for the ESPC program. For-Profit financial institutions are used to raise the capital needed for the infrastructure improvements. This is the function under analysis in this project.

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[41] Prather, Charles, *Money and Banking*, Business Publications Inc, Homewood Il, 1969, p. 264

[42] Ritter and Silber, *Principles of Money Banking and Financial Markets*, Basic Books Inc, NY, 1986, p. 244

[43] Ibid, p. 244

E. DEFENSE WORKING CAPITAL FUNDS

The DoD defines the principle of working capital funds (WCF) as, "The cyclical nature of the cash flow into and out of the fund—providers of goods and services finance their continuing operations with income derived from sales to customers."[44] The key to the WCF fund is the disassociation from direct appropriations, instead relying on sales to DoD customers to sustain operations. The DoD states, "Business Areas use income derived from these sales to buy or replace inventory and to finance the continuing production of future goods and services without fiscal year limitations."[45] Figure 2 is the graphical representation of the WCF system.

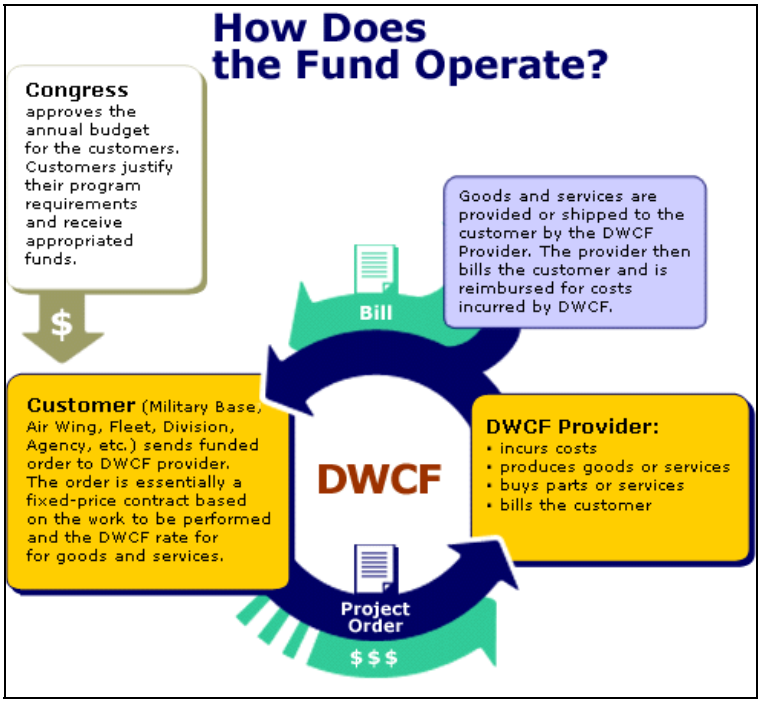

Figure 2. DoD's WCF Operational Cycle

OSD Comptroller, iCenter, http://www.dod.mil/comptroller/icenter/dwcf/revolvingfund.htm

[44] Department of Defense Comptroller, iCenter, Revolving Fund, [online database] available from http://www.dod.mil/comptroller/icenter/dwcf/revolvingfund.htm, accessed 15 Sep 05

[45] Ibid

The flow of appropriated funds through the WCF allows the DoD to meet real world commitments. According to the iCenter, once customers send appropriated dollars to the WCF to pay for services or goods, the money no longer has to be spent before the end of the fiscal year. The WCF, therefore, acts much like a bank that lends capital and takes deposits. The advantage to this system is the ability of the WCF to vary its operations based on the needs of its customers and to meet its long-term goal.

The goal of the WCF is not to be profitable, but rather to break even. The iCenter states, "Unlike profit-oriented commercial businesses, DWCF Business Areas strive to break even over the long-term, and set prices accordingly."[46] Thus, the WCF is an entity that allows appropriated dollars to be spent without fiscal year restrictions, on needed goods and services, with a long-term break even business plan.

[46] Department of Defense Comptroller, iCenter, Revolving Fund, [online database] available from http://www.dod.mil/comptroller/icenter/dwcf/revolvingfund.htm, accessed 15 Sep 05

III. ANALYSIS OF CURRENT ESPC FINANCING SYSTEM

A. THE CASH FLOWS

The cash flows associated with the ESPC program leave indelible marks that can be traced back to the beginning of various projects. For every project four critical tasks are accomplished.

1. The government identifies the need for an energy conservation measure.
2. The government and the supplier agree upon a price.
3. The supplier accomplishes the service.
4. The government repays the supplier for the services during agreed upon term and amount.

At some point during this process cash exchanges hands. The exchange point is different based upon the mechanism used. Furthermore, the parties involved are not always the same. Thus, an analysis of the current cash flow options will help demonstrate the critical nature of financing ESPC projects.

1. Fully Funded Projects Via Appropriations

All energy projects can be accomplished without financing through a bank. Full, up-front appropriations are the first option to accomplishing the same results of an ESPC. The flow of cash begins with the purchasing of Treasury Bills, assuming that the government is currently borrowing money to meet budgetary requirements, or meeting requirements by collecting taxes from the general public. From there, obligational authority is provided an installation to procure the equipment and installation of an ECM via a congressional approved appropriation. The local installation then compensates the contractor with outlays whose cash may be traced back to Treasury Bill sales or the collection of income and other taxes, thus completing the transaction.

The traceable cash flows end, in the up-front appropriations process, at the project completion point. The facility will require less energy due to the installation of the ECM but it will (or may) not be able to accurately quantify the amount. Furthermore, the installation does not realize a benefit from the reduced energy bill because the forgone expenses never materialize as additional money available for further infrastructure investment at that particular location.

2. External ESPC Financing

The process of identifying, designing, and construction the ECMs is identical regardless of the funding stream. The current method of funding ESPC requires that the financing of the project be determined early in the project. In this case, the ESCO secures a construction loan from a lender specializing in this type of contract. At this point the process becomes much more complicated.

The cash flows of ESPC have no discernable beginning. The capital needed to begin the process resides in the reserves of the few financial institutions that offer ESPC loans. The capital is generated by pooling interest from other funds loaned to consumers. The bank collects the interest, pools it together, and sends it to the installation to be invested in a project.

At the time of contract award, the ESCO begins to implement the required ECMS. The cash needed for the work is obtained from the financial institution funding the entire project. No appropriations are needed to implement this phase of the project.

At project completion, the government becomes liable to pay the ESCO an annual payment near the level of energy saved from the installed ECMS. The agency still realizes no net change in its outlays, now there are two separate bills to pay that, in theory, amount to a quantity less than the previous bill without the ECMS installed. One payment goes to the utility company, the other, to the ESCO. The ESCO, in turn, sends the money onto the financial institution to service the debt on the ESPC construction loan.

The financial institution takes the cash flow returning from the ESPC contract, bundles it with other inflows from its other loans, and lends money again. This is done each subsequent year, allowing the bank to loan capital for more projects while earning a profit.

B. THE NOMINAL PROJECT

Historical data were used to determine the average size, scope, and terms of ESPCs within the DoD. The GAO gathered the following data.

Table 1. GAO Report

Service	Number of Projects	Total Costs
Air Force	63	$ 760,012,66
Army	47	$ 324,374,96
Navy	40	$ 653,376,18
Other	3	$ 21,040,42
DoD Total	153	$ 1,758,804,23

The DoD, over the specified time period entered into 153 contracts with total costs amounting to $1.76B. The total cost figure includes both the investment and finance charges over the lives of the contracts. The GAO also reported that the average interest rate for all ESPC contracts was a hefty 8% and the repayment term averaged 16 years.[47] All of this data allows the extrapolation of the average finance charges for an ESPC contract.

1. Determining Average Investment and Average Financing Charges

The sum of all payments, on average, is $1.76B / 153 projects = $11.5M/ESPC. Each payment over the 16 year average payback period must be equal, therefore, each

[47] General Accountability Office, Energy Savings: Performance Contracts Offer Benefits, but Vigilance Is Needed to Protect Government Interests, p. 15, [database online], GAO-05-340, June 2005, available from www.gao.gov/cgi-bin/getrpt?GAO-05-340

contract has $11.5M / 16 years = $718K/year obligation. The rules of ESPC contracts state that an obligated payment must be no more than the quantity of energy saved. Thus, it is assumed that, at a minimum, the average project saved a value of energy equal to the debt payment of the average project.

The average annual payment of $718K, the known average interest rate of 8%, and the average 16 year term now allow a calculation of the total principal invested by the financial institution and the amount of interest paid by the government over the life of the loan. Using a present value calculation, the beginning value of the average ESPC project is $6.4M. Subtract the investment from the total cost of $11.5M and the total amount of interest paid by the government over the life of the average loan is$11.5M - $6.4M = $5.1M. Therefore, financing significantly adds to the total cost of energy reduction projects. Granted the total interest is not in present value terms, but the 80% increase in total cost is staggering.

2. Defining the Nominal Project

The nominal project will be used later to compare alternative financing strategies. To reduce complexity, comparisons will be made based on the cost and benefit of investing not a total dollar figure, but rather in another nominal project. In this case, an investment will equal one new average ESPC project, representing $6.4M. Each year the government must repay $718K or the equivalent of .13 or 13% of an investment in the nominal project. This continues each year until the loan in paid off in year 16.

The nominal project does not change in size and scope for this analysis. Over time, the forces of inflation will raise the cost of the nominal project as well as the annual value of the energy saved. The two do not rise at the same rate. Therefore, it is assumed that in the future a nominal project will be approximately the same cost, in 2005 dollars and save approximately the same value of energy in 2005 dollars.

C. EXTERNAL FINANCING CASH FLOW MODEL

Modeling the net annual cash flows, assuming that the government has the requirement to continually invest in energy reducing equipment using the ESPC program, demonstrates the long term ramifications of using this program.

1. External Financing Cash Flow Model Structure

In this model, it is assumed that the government requires a single investment each year into the nominal ESPC project. The investment, represented by a 1 (a single nominal project), is a positive cash flow into the government coming from the financial institution. Following the investment are 16 consecutive -.13 (a percentage of a nominal project) cash payments by the government back to the financial institution. In the model a single investment is undertaken each year. The model could be taken out into perpetuity, however, for this analysis, the last investment was made to coincide with the final payment of the first investment. Therefore, there are 17 total projects purchased over the life of the model.

The actually savings from the reduced energy bills are not taken into consideration in this model. The utility savings are independent of the financing mechanism. The savings are relevant to the analysis of the ESPC program's true cost when compared to the status quo, outside the scope of this paper.

2. ESPC External Financing Results

The model demonstrates that, with constant annual investment, the net cash flows of the ESPC program decrease each year. Eventually, during year nine cash flows are actually negative. At this point, the one new investment is smaller than the obligations incurred from the previous projects. The increase in negative net cash flows is constant until the investments stop. Without new investment to offset required payments, the net cash flow for the ESPC program jumps to its most negative point and the declines back towards zero as debt service on contracts is completely paid off. Table 2 summarizes the cash flows.

Table 2. Annual ESPC Nominal Project Cash Flows

Year	Cumulative Projects	Net Nominal Project Cash Flow	Net Dollar Cash Flow in x000,000
0	1	1	$ 6.35
1	2	0.887	$ 5.63
2	3	0.774	$ 4.91
3	4	0.661	$ 4.20
4	5	0.548	$ 3.48
5	6	0.435	$ 2.76
6	7	0.322	$ 2.04
7	8	0.209	$ 1.33
8	9	0.096	$ 0.61
9	**10**	**-0.017**	**$ (0.11)**
10	11	-0.13	$ (0.83)
11	12	-0.243	$ (1.54)
12	13	-0.356	$ (2.26)
13	14	-0.469	$ (2.98)
14	15	-0.582	$ (3.70)
15	16	-0.695	$ (4.41)
16	17	-0.808	$ (5.13)
17	17	-1.808	$ (11.48)
18	17	-1.695	$ (10.76)
19	17	-1.582	$ (10.05)
20	17	-1.469	$ (9.33)
21	17	-1.356	$ (8.61)
22	17	-1.243	$ (7.89)
23	17	-1.13	$ (7.18)
24	17	-1.017	$ (6.46)
25	17	-0.904	$ (5.74)
26	17	-0.791	$ (5.02)
27	17	-0.678	$ (4.31)
28	17	-0.565	$ (3.59)
29	17	-0.452	$ (2.87)
30	17	-0.339	$ (2.15)
31	17	-0.226	$ (1.44)
32	17	-0.113	$ (0.72)

The present value (PV) of the net cash flows over the life of the program demonstrates whether the benefits of the upfront investment outweigh the cost of the annual debt service. In order to calculate the PV a discount rate must be established.

The discount rate for this calculation was set at the average yield of the 10-year Treasury Bill. Treasuries represent the opportunity cost of capital for the government, or the cost of capital without using the external financing. The 10-year also is appropriate

because its maturity is near the length of the average ESPC term. During 2005 the 10-year has fluctuated between 4.0% and 4.5%.[48] In order to be conservative the high of 4.5% was used for the PV calculation.

At the recommended discount rate, the PV of the net cash flow from externally financing the ESPC program is -3.15 nominal projects or $-20.2M. Therefore the costs outweigh the benefits by accepting an annual investment of $6.4M for a nominal project for 17 years. The PV demonstrates how the concerns over the costs of ESPC are not baseless but actually must lead to exploration into viable alternatives.

D. REALITIES OF EXTERNAL FINANCING

The reality of externally financing the ESPC project is the inevitable bill that must be paid with future appropriations. The federal government must increase the level of financing each year to have a positive net cash flow from aggregate projects. Otherwise, the service on the debt becomes larger than the new investment resulting in a negative net cash flow for the entire energy program. Table 2 demonstrates this phenomenon in year nine. At this point in time, the annual cost of each project is greater than the new investment. Thus, the negative net cash flow.

The early years of the model reflect the temptation of exploiting this program to its fullest potential. The initial investment inflows are extremely large compared to the required annual repayment. It is not until after the net cash flows become negative when the true cost of the program becomes apparent. However, it is unlikely that the full affect of negative cash flow will become apparent due to the decentralized nature of the program.

[48] Yahoo Finance, 10 Year Treasury Yield, [online database], available from http://finance.yahoo.com/q/bc?s=%5ETNX&t=5y, accessed on 1 Sep 05

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IV. INTERNAL FINANCING ALTERNATIVE

A. OVERVIEW

The value of the energy savings being unlocked by ESPCs gives the DoD an enticing opportunity to reinvest into more energy projects. The DoD has the resources to establish a fund that, over the long run, will not only improve critical infrastructure, but will also unlock the money currently required by the outdated energy intensive equipment.

B. CASH FLOW ANALYSIS OF PROPOSED PROGRAM

For the purposes of this study a hypothetical financing structure and path were established. The proposal follows the same steps as the current ESPC financing method but with a DoD revolving fund acting as the financial institution. The structure of the cash flow model is as follows:

1. The ESPC Fund, based on the Defense Working Capital Fund concept, receives a corpus from Congress earmarked for the sole purpose of financing ESPC projects.

2. DoD facilities follow current ESPC methods up to the point where financing terms are determined.

3. At the time of contract award, the ESPC Fund, replaces the private bank's role by financing the project on behalf of the installation.

4. After construction, the installation, repays the ESPC Fund, just as it would a private bank, until the project is paid in full.

5. The ESPC Fund, takes the repayment annuity, and reinvests the proceeds into additional projects, starting the cycle over.

In this model, the ESCO and the installation are completely insulated from the project financing, just as they are under the current program. The ESPC fund simply replaces the financial institution, remaining removed from the engineering and construction phases of the projects.

C. ASSUMPTIONS

The hypothetical program assumes a high level of consistency between the current program and the proposed program.

1. The ESPC fund operates with a long-term requirement to breakeven, thus the fund is not free of cost, but only charges for administrative cost recovery.

2. The interest rate set by the ESPC Fund will be less than or equal to the most competitive rates offered by private financing institutions.

3. The ESPC Fund assumes risk of performance failures. Currently private banks have to hedge, with higher interest rates, against the DoD not paying ESCOs for unrealized savings.[49] New contract mechanisms must be implemented to keep the incentive for ESCOs to be conservative in estimating ECM performance but should be immaterial to the financing.

4. The average scope of the contracts and average annual savings generated by each contract will remain constant with the ESPC Fund financing projects. The only changes should be the interest rate charged by the Fund and the length of the repayment term needed to fully recoup the initial investment.

5. All interest rates are fixed during the life of the program.

D. ESPC FUND MODEL

A hypothetical investment model, from the perspective of the ESPC Fund was created to see how well the reinvestment strategy would work. The basis for the model was the nominal project derived from the GAO data. The model was used to calculate the net present value of the cash flows resulting from the use of the ESPC Fund.

1. The ESPC Fund Nominal Project

The ESPC Fund changes the parameters of the nominal project. Previously, the nominal project terms were calculated using the average interest rate, determined by the lending institutions, and the average payback term, derived from the interest rate and

[49] Finance Cost Reduction Working Group, Reducing Financing Costs for Federal ESPCs, [online database] , page 5, available from www.ornl.gov/sci/femp/pdfs/fcrwg_rpt_espcsc_041207.pdf accessed December 7, 2004

maximum allowed payment based on energy savings. The ESPC Fund only has to recover its costs, operating on a long-term, breakeven basis. Therefore, the fund's interest rate only has to recover operating costs and the cost of borrowing for the government.

The cost of borrowing is the most significant cost driver for the ESPC Fund. Assuming the Fund gains its initial corpus from government debt, an appropriate rate would be the same as the 10-Year Treasury Bill, approximately 4.5%. The operating cost recovery factor will be orders of magnitude smaller than the financing charge. Due to the relatively small operating cost, compared to the total cost of the projects, this recovery factor was not considered during this analysis.

The nominal project for the ESPC Fund represents the same initial investment, $6.4M, as the externally funded project. The value of energy saved is also the same, $718K, or .13 of a nominal project for both financing methods. The interest rate for the ESPC Fund project is initially set at 4.5% resulting in a loan term of only 12 years, four years shorter than the externally funded program.

2. ESPC Fund Model Results

The ESPC Fund model represents investment in the first nominal project as a net negative cash flow of a single project for the government. Subsequently this project generates the equivalent of .13 projects each year in energy savings. These savings are sent back to the ESPC Fund, represented by a positive cash flow. The Fund, in year two, invests in another typical project but uses the positive cash flow from the year one project's savings to offset the cost of the investment: 1 new project required - .13 savings from previous project = .87 net new funding required for another nominal project investment.

Assuming that the second project generates another savings of .13 projects, the Fund will have .26 equivalent projects to reinvest in year three's nominal project,

resulting in a -.74 net cash flow. As the cycle continues, eventually, the cash generated from the energy savings is enough to finance entire projects without additional investment.

In year nine, the ESPC Fund becomes cash flow positive. At this point, the Fund is collecting more in energy savings than is required to invest in another nominal project. Energy projects are self sufficient beyond the cash flow positive point. Table 3 represents the net nominal project cash flows for 17 projects (the same amount as the external financing model).

Table 3. Internal Financing Nominal Project Cash Flow

Year	Cumulative Projects	Net Nominal Project Cash Flow	Net Dollar Cash Flow x000,000
0	1	-1	$ (6.35)
1	2	-0.887	$ (5.63)
2	3	-0.774	$ (4.91)
3	4	-0.661	$ (4.20)
4	5	-0.548	$ (3.48)
5	6	-0.435	$ (2.76)
6	7	-0.322	$ (2.04)
7	8	-0.209	$ (1.33)
8	9	-0.096	$ (0.61)
9	10	0.017	$ 0.11
10	11	0.13	$ 0.83
11	12	0.243	$ 1.54
12	13	0.356	$ 2.26
13	14	0.356	$ 2.26
14	15	0.356	$ 2.26
15	16	0.356	$ 2.26
16	17	0.356	$ 2.26
17	17	1.356	$ 8.61
18	17	1.243	$ 7.89
19	17	1.13	$ 7.18
20	17	1.017	$ 6.46
21	17	0.904	$ 5.74
22	17	0.791	$ 5.02
23	17	0.678	$ 4.31
24	17	0.565	$ 3.59
25	17	0.452	$ 2.87
26	17	0.339	$ 2.15
27	17	0.226	$ 1.44
28	17	0.113	$ 0.72

The PV of this stream of cash flows is zero. The discount rate is once again 4.5%. Since the cost of borrowing via Treasury Bills is the same as the discount rate, the PV is zero. The zero PV represents the benefits of positive cash flows equals the up-front cost of internally financing the nominal projects.

3. ESPC Fund at Similar Commercial Rate

The ESPC Fund does not have to be structured to be a lower cost alternative to private financing. It can also be structured to replace, at the same terms and rates, the loans currently being used in the ESPC program. A second internal financing model was run with the same terms as the external nominal project (8% interest rate over 16 years). Table 4 represents the cash flows for this scenario.

Table 4. Internal Financing With External Financing Rate's Nominal Cash Flow

The PV of this strategy's nominal project cash flow is 1.98. Therefore, by using

Year	Cumulative Projects	Net Nominal Project Cash Flow	Net Dollar Cash Flow x000,000
0	1	-1	$ (6.35)
1	2	-0.887	$ (5.63)
2	3	-0.774	$ (4.91)
3	4	-0.661	$ (4.20)
4	5	-0.548	$ (3.48)
5	6	-0.435	$ (2.76)
6	7	-0.322	$ (2.04)
7	8	-0.209	$ (1.33)
8	9	-0.096	$ (0.61)
9	10	0.017	$ 0.11
10	11	0.13	$ 0.83
11	12	0.243	$ 1.54
12	13	0.356	$ 2.26
13	14	0.469	$ 2.98
14	15	0.582	$ 3.70
15	16	0.695	$ 4.41
16	17	0.808	$ 5.13
17	17	1.808	$ 11.48
18	17	1.695	$ 10.76
19	17	1.582	$ 10.05
20	17	1.469	$ 9.33
21	17	1.356	$ 8.61
22	17	1.243	$ 7.89
23	17	1.13	$ 7.18
24	17	1.017	$ 6.46
25	17	0.904	$ 5.74
26	17	0.791	$ 5.02
27	17	0.678	$ 4.31
28	17	0.565	$ 3.59
29	17	0.452	$ 2.87
30	17	0.339	$ 2.15
31	17	0.226	$ 1.44
32	17	0.113	$ 0.72

the terms currently utilized by external financing, the ESPC Fund realizes a sizeable benefit over the cost of the investments. Just as in the previous scenario, starting in year nine, the repayments from the previous projects are combined to pay for an entirely new project, without the need for more investment. The magnitude of the benefits would be enhanced further if the residual benefits were reinvested in either larger or more numerous projects. The goal should be to have as much capital as possible invested in the infrastructure, producing more streams of income available for reinvestment.

Initially, this strategy looks to violate the assumption that the Fund operates at a breakeven basis, only recovering costs. While the higher rate does result in more money flowing into the fund, the increased influx allows for greater investment. The Fund will still run at a breakeven basis by investing in more projects. The DoD benefits from the greater investment thus the assumption is not violated by this scenario.

V. RECOMMENDATIONS

A. IMPLEMENTATION OF ESPC FUND

The DoD should internally finance its ESPC program with a revolving fund. The cash flow models of nominal projects demonstrate the immense potential of internal financing. The Fund will increase the amount of infrastructure investment at a lower cost without negative long-term cash flows.

The DoD does not meet the definition of a borrower in need of capital from a financial institution. According to Prather, banks and lending institutions are designed to pool capital together to lend to borrowers without the means to raise the money on their own. The government already has the capital raising mechanism internally in place. Treasury Bills allow the government to raise capital at a much more advantageous rate because the government does not have to earn a profit on the money borrowed. Therefore, the federal government should not be using commercially available loans to fund the ESPC program.

As the DoD's infrastructure's energy efficiency is increased with each successive investment, the fund will face diminishing returns. In the absence of new technology, the available investments that meet the required returns will become scarce. During this time frame, the fund will be able to return surpluses back to the Treasury. Eventually, a successful implementation of the Fund will result in newer, more efficient equipment, lower energy bills, and repayment of the investment back to the Treasury, not a private lending institution and its shareholders.

B. PARAMETERS OF THE ESPC FUND

The ESPC Fund should follow the same parameters of other revolving funds. The fund should be run for long-term breakeven, reinvesting all energy savings (less administrative costs). At the full, breakeven level the government will realize the maximum return from the EPSP program investment.

The Fund should set an interest rate closer to the commercially available rate rather than the minimum rate needed to off set the cost of borrowing and the administrative cost of running the Fund. A higher interest rate, in this case, does not raise the cost to the government. In reality, the higher rate actually makes more of the energy value unlocked by the project available for reinvestment into the energy infrastructure.

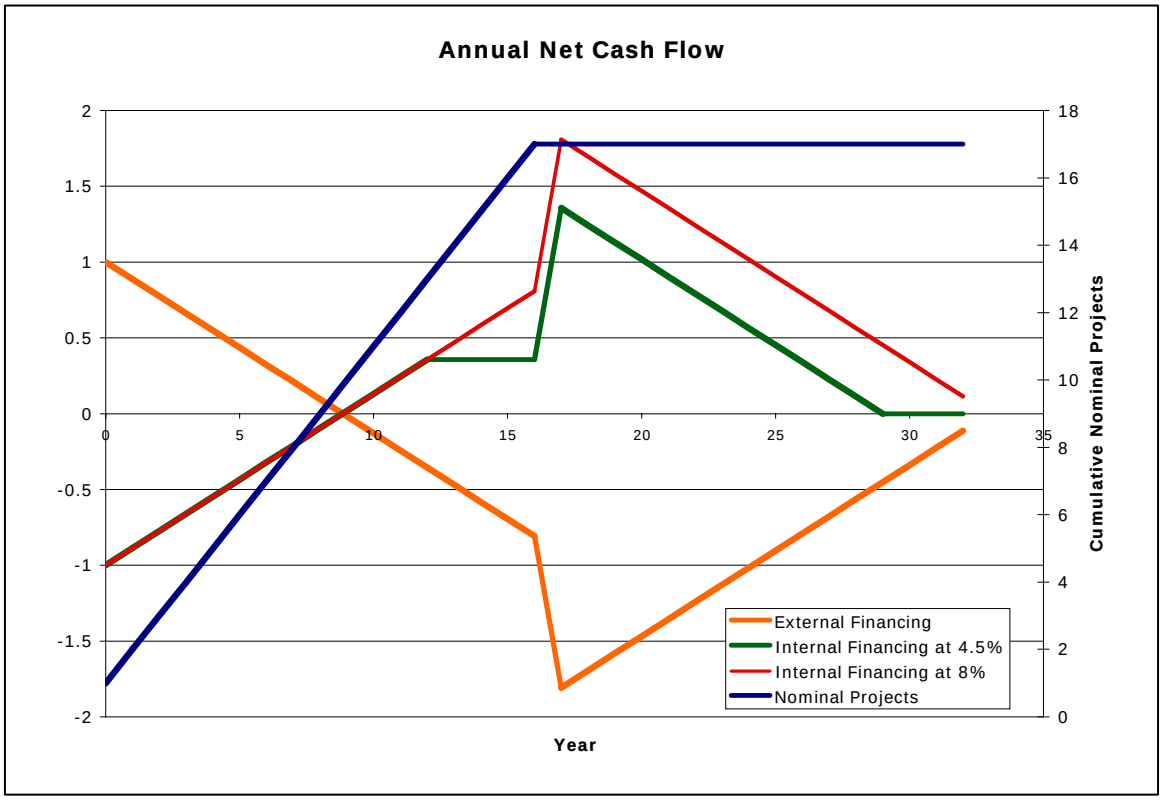

Figure 3. Annual Cash Flow Comparison of Each Financing Alternative

Figure 3 illustrates the long-term implications of financing the ESPC program. Under the current program, the net cash flows, at a constant level of investment, become more negative each year. Additional capital can be borrowed to alleviate the negative effects, however, as seen in year 16 when the investments are eliminated, the impact of no further investment is tremendous. Therefore, the current system establishes an incentive for financial managers to continually borrow capital. New investments can be made as long as there are viable projects, however without significant technological

advancements, returns on investment will diminish over time. When the returns no longer justify the investment, the reality of the combined debt obligations will be overwhelming.

The internal financing of energy projects would act in opposition to the current program. The program begins with a negative cash flow. Therefore, there is an incentive for financial managers to reinvest as much capital as possible to unlock the greatest value. In the internal scenario, when there are few viable projects, the managers are not confronted with two unsatisfactory alternatives but rather they have the enviable option of not investing and realizing a tremendously higher net cash flow. The Fund will not invest in more projects because it has to but rather it will be incentivized to limit investment when it is in the best interest of the government. The recommended parameters of the internally financed ESPC will result in more energy wealth and a better portfolio of energy infrastructure investments.

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VI. CONCLUSION

A. RESEARCH QUESTIONS

The ESPC financing models do answer the proposed research questions.

1. Primary Research Question

Does internal financing of the ESPC program create energy wealth for the DoD?

The internal financing mechanism demonstrates that energy wealth can be created within the DoD. The ESPC Fund model is likely to result in a greater PV for the government than the current program. The greater PV represents an end state where the government has been able to realize greater energy infrastructure investment. This level of investment would have been nearly impossible to attain under normal appropriations or even the current ESPC program, thus creating wealth for the DoD.

2. Secondary Questions

What is the financial magnitude of using internally financed projects instead of the current private lending institutions?

The magnitude of wealth creation was shown to be dependent upon two factors. First, the interest rate used to calculate the payback terms is critical in assessing the PV of the program. The higher the interest rate resulted in the higher the returns to the ESPC Fund. The higher rate led to more cash flowing back into the fund that increases the reserves available to be reinvested.

The second important factor that determines the financial magnitude of the program is the reinvestment rate. In the model, the ESPC Fund only invested in one project per year. Eventually, the Fund would have an increasing cash balance. Excess investment is needed to put as much money to work as possible, thus increasing the return for the government. The model, therefore, is inherently conservative and the financial impact from reinvestment should be much greater.

Is there a logical investment cash flow using internal financing mechanisms for ESPC projects?

The analysis shows the cash flow, based on the Working Capital Funds already in place, is both logical and advantageous for the government. In this format, the transactions required to fund a single project originate from a single source. The energy savings are then redirected back to the ESPC Fund. The consistency and predictability of the cash flows allow for the model to effectively predict future in-flows and out-flows.

B. FUTURE RESEARCH TOPICS

The financing of the ESPC program has many facets that lead to future research topics. First, the practical application of the internal financing option could be explored. The implementation of the Fund must take into account administrative costs, interest rate fluctuations, ECM performance risk, and maintaining the incentive for ESCOs to deliver results at or above the desired performance level. The magnitude of these costs could hinder the real-world implementation of this proposal.

Measurement and Verification (M&V) is another aspect of the program that needs further research. External financing requires M&V to be accomplished before payments are made to the financial institutions. Will implementation of internal financing eliminate the need to spend money each year to verify performance? Further research could provide the first clear evidence of the financial benefits of M&V.

Finally, future research could look at the effects of bundling various ECMs together in the internal financing program. Currently, projects with short payback periods are used in a bundle to subsidize the payback of projects that may have payback periods greater than the 25-year requirement. Should bundling be done at the installation level or by the ESPC Fund in the internally financing environment,? The Fund may be able to bundle projects from various installations, under one contract, to obtain an optimal investment portfolio.

C. SUMMARY

The lesson learned from this analysis is that as the DoD moves toward a more efficient funding of the ESPC program it has two choices: 1. Increase the use of private financing each year, spreading the cost over a long time period, delaying the inevitable annual negative cash flow, or 2. Use the internal ESPC Fund to facilitate long-term investment in the energy infrastructure with a significant up-front cost. Unfortunately, there is no free lunch.

DoD's energy infrastructure is not going to become more efficient and reliable over the period of one or two years but rather over decades. Infrastructure requires constant investment. Improving the overall performance is the result of adequate investment, year after year. However, energy infrastructure is not a high visibility funding target and as resources available to DOD shrink over the next few years, energy infrastructure needs are likely to be overlooked or underfunded in the annual appropriations process. The ESPC program augments the annual appropriations, allowing installations to implement a comprehensive, long-term energy plan.

The ESPC program, as it is currently funded, endangers the long-term viability of installation energy plans. At some point the net ESPC cash flows for the government, relative to full up-front appropriations, will become negative. During these periods, caused by limited ESPC investment, DoD financial managers will be forced to find money to meet the debt obligations. Where will this money come from? It could come from additional appropriations, but the most likely source of funds will be the vulnerable programs the ESPC is supposed to support, infrastructure improvement programs. Therefore, the current funding methods of ESPCs jeopardize the very programs they are intended to support.

Internally financing the ESPC program avoids the negative aspects of using external capital. Furthermore, the positive future cash flows of the program will allow for future investments that pay for themselves, not at the expense of other programs. This strategy allows the ESPC program to succeed, with regular appropriations, at making the overall DoD footprint more efficient, not in spite of it. The internally funded

ESPC program could be the key to providing DoD with a self-sustaining energy infrastructure improvement program where new projects are funded by the wealth unlocked from previously completed project's.

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